European Journal of Special Education Research
ISSN: 2501 - 2428
ISSN-L: 2501 - 2428
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejse.v8i3.4288 Volume 8 | Issue 3 | 2022

THE BRAILLE SYSTEM: THE WRITING AND READING SYSTEM THAT BRINGS INDEPENDENCE TO THE BLIND PERSON

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Abstract:
The braille System is the most adopted writing and reading process in relief worldwide and includes the writing of the alphabet and of mathematical, chemical, phonetic, computer, and musical symbols. This text aims to explain what the braille System is and its importance for the independence of the blind person. In addition to demonstrating the appropriate distance between the points and proving that writing on the conventional slate is the best resource for correct writing in braille, the main objective of the research is to emphasize the importance of using the braille System and to value the conventional slate as a braille writing instrument. From the reading of theoretical texts and writings performed using both slates, the result is even more evident that writing on the conventional slate meets the tactile reading of the blind person, who uses the pad of the index finger to feel the braille dots.

Keywords: Braille, visual impairment, blindness, specialized education, education, specialized materials, slate

1. Introduction

The use of the braille System as a writing and reading system for blind people is still the main way to access information in a democratic way. With technological advances, there has been an increase in the use of audiobooks, talking books and recorded classes, but the blind individual, when receiving knowledge by listening, does not exercise the same synapses as if they were reading and writing in braille. The practice of reading and writing is irreplaceable and brings cognitive benefits to those who perform it.

According to Almeida (2014) and Lupetina (2019), for the blind child who is in the reading and writing acquisition process, the use of braille to read and write is fundamental for the cognitive development of this child.

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Braille is a reading and writing system with raised dots used mainly by blind people. This system was created in the year 1825 by Louis Braille, a young blind Frenchman. When presenting the System proposal to the director of the Royal Institute for the Blind Youth in Paris, Louis Braille referred to it as:

> "*A very simple tactile writing and reading system that allowed the representation of letters, numbers, accentuation, punctuation and basic arithmetic symbols. Furthermore, the system had the advantage of allowing each of the symbols to be recognized by a blind person only with the contact of the most sensitive part of the index finger ('the pad').*" (Abreu, 2008, p.15)

About the spelling of the word braille, which is a non-consensual matter, it must be written containing two "l" and starting with a lowercase "b" when referring to the braille writing and reading System. When writing Braille with capital letters we are referring to Louis Braille, the creator of the System. According to the official document on the braille spelling for the Portuguese language:

> "*The Brazilian Braille Commission (CBB), established by Ministerial Ordinance Number 319, of February 26th of 1999, about the correct spelling of the word "braille" (braille), at an ordinary meeting held on June 08, 09 and 10, 2005, in the city of Rio de Janeiro, prepared this opinion that, initially clarifies and, in the end, recommends the following: [...] The Braille System was brought to Brazil by José Álvares de Azevedo, a blind young man, former student of the Paris Institute, in the year 1850, officially employed in our country after the installation of the Imperial Institute of Blind Boys (today, Benjamin Constant Institute), in 1854, prevailing the original French spelling: "braille". [...] For historical, cultural, linguistic and legal reasons, explained above, the Brazilian Braille Commission recommends that the word "braille" be always spelled with two "ls", according to the original French form, internationally used*." (Brasil, 2018, p.93-95)

Thus, throughout the text, the word braille will be written with a lowercase "b" and containing two "l". Another necessary contextualization refers to the option of the term "blind", "blind person", "blindness", instead of "visually impaired". When using the expression visually impaired, we are encompassing blind people and those with low vision. People with low vision do not use braille as a writing and reading System, they use enlarged letters. In this way, people with low vision write in notebooks with an enlarged ruling layout, in which the lines are further apart, allowing the execution of larger letters, and the printed materials must be in font size 24, preferably Verdana font, so that the person with low vision can use the visual residue for reading. Therefore, in this text, the term blind (person) will be used, as we are specifically addressing the braille writing and reading system, used by the blind.

After this brief introduction on what the braille System is and for whom it is intended, it is important to explain the materials that are used for braille writing, as well as the objectives of this research.

Braille writing can be done using the slate and stylus or the braille typing machine. The slate is composed of a ruler, which can be made of metal or plastic, and a stylus used to make the dots in relief in the braille System. Some slates are based on a wooden plank and some are not. The slate ruler is usually composed of four lines. This ruler opens as if it were an "alligator mouth", and inside it we fit a paper of thicker weight. Afterwards, we close the ruler and use the stylus to press the paper and form the points in relief. The stylus head can be made of wood or plastic, while the pin that makes the hole is always made of iron/metal.

There are also some slates in which the entire page is composed of ruler lines, called: page slate. In this way, we fit the heavy-weight sheet, close the page slate and write continuously, without having to "pull down" the four-line ruler. The great advantage of the slate is its practicality and affordable cost, in addition to being a lightweight material, easy to transport and long-lasting.

Another resource used for writing in the braille System is the braille typing machine. The most famous brand is Perkins (of German origin), which has great durability and resistance, but has three disadvantages: it is very heavy, as it is made of iron, which makes transport/transfer difficult; it usually presents the need for annual maintenance; and it has a high cost (on average, Perkins costs approximately three thousand five hundred reais). In competition with the German model, other brands launched their machines. In Brazil, the institution Laramara, in São Paulo, made braille machines with lighter material (plastic) and at a lower cost.

It should be noted that, in addition to the conventional slate and the braille typing machine, there is on the market a slate called "positive slate", in which the stylus is hollow and the ruler is protruding (instead of curved). However, the blind community that uses the braille System does not approve of the use of the positive slate, because the writing of braille is not the same, and the points start to have a greater distance. There were tests in Brazil carried out by blind teachers and researchers using the positive slate and this one was not approved, thus maintaining the use of the conventional slate in classrooms in specialized institutions in Brazil.

Thus, it is necessary for this text to demonstrate the difference between braille writing in the conventional and in the positive slate to contribute to other research related to the writing of the braille System, and the importance of materials being validated by blind people and braille users, instead of being simply conceived and marketed by sighted people.

1.1 Purpose of the study

The objective of the research is to emphasize the importance of using the braille System and to reinforce and value the conventional slate as a braille writing instrument.

1.2 Objectives of the study

1) To explain what the braille System is and the importance of braille for the blind community.
2) To demonstrate what braille dots look like and the correct distance between dots.
3) To prove that the conventional slate is still the most suitable resource for writing braille.

It is worth mentioning that, as this text is within the theme of visual impairment and it contains images, there will be a description below each image. The text description below the images allows the blind person who has access to the text in digital format (ebook) to use the technological resource of a screen reader (already available in most cell phones) that transforms the text into voice. In this way, the blind person hears the text description of the image and is aware of what is in the image, even without seeing it. With that, it is hoped that other authors and researchers feel encouraged with this practice and start to place the description of the image under the images exposed in their texts, so that, in this way, the blind, from the screen reader, can know what is there in each image.

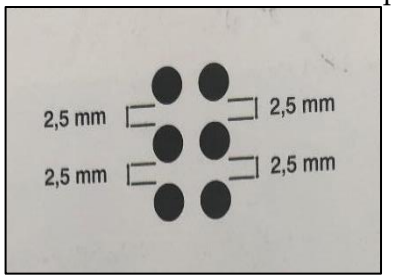
2. Literature review

After contextualizing what the braille System is and the most appropriate way of writing, it is necessary to present the correct location of the points of a 'braille cell'. We call a 'braille cell' the set of six points, which is the matriarchal/fundamental set of braille, represented by: =.

From that set of points: points, 1,2,3 (on the vertical left) represented by: **1**. And from the points 4,5,6 (on the right vertical side), it is possible to constitute 63 symbols, whether letters, numbers, mathematical, musical, or graphic signs, among others. The points are numbered from top to bottom and from left to right.

When writing braille on a conventional slate or on a braille typing machine, the braille dots have a specific distance, as shown in Image 1.

Image 1: Distance between vertical points

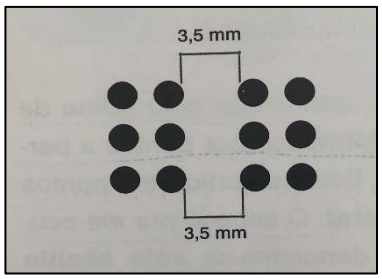


Source: Abreu (2008).

Image description: black and white image. Six black balls arranged in two columns and three rows. Between the vertical balls, there is a bracket informing the distance of 2.5 mm between each ball.

In Image 1, it is possible to see that the distance between the dots of the braille cell is of 2.5 mm. The correct distance of the dots is important so that the blind person can feel the braille dots with the pad of the index finger when reading, because the premise of braille reading is precisely the independence it brings, allowing the blind person to perform the reading using the pad of the index finger. If this distance is greater than indicated, it will be difficult for the blind person to feel the dots using the pad of the index finger.

Image 2: Distance between one cell and another

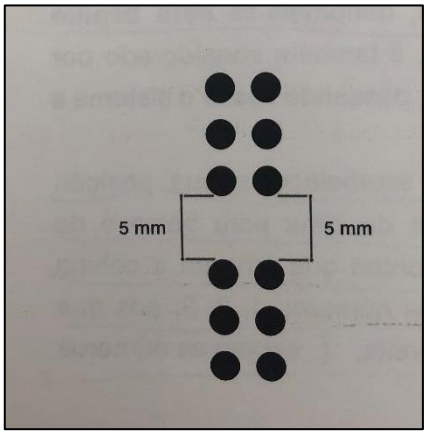


Source: Abreu (2008).

Image description: black and white image. Two braille cells side by side. Each with six black balls, arranged in three rows and two columns. Between the two sets of six balls there is a top and bottom bracket (horizontal) informing the distance between the sets of dots: 3.5 mm between each braille cell.

Image 2 demonstrates the distance between the braille cells. This distance is important for us to understand when one letter ends and another begins, or when a number or symbol ends and another begins. In this way, this distance of 3.5 mm allows the blind person's tactile reading to identify that they are distinct symbols due to the spacing.

Image 3: Distance between the cell above and below



Source: Abreu (2008)

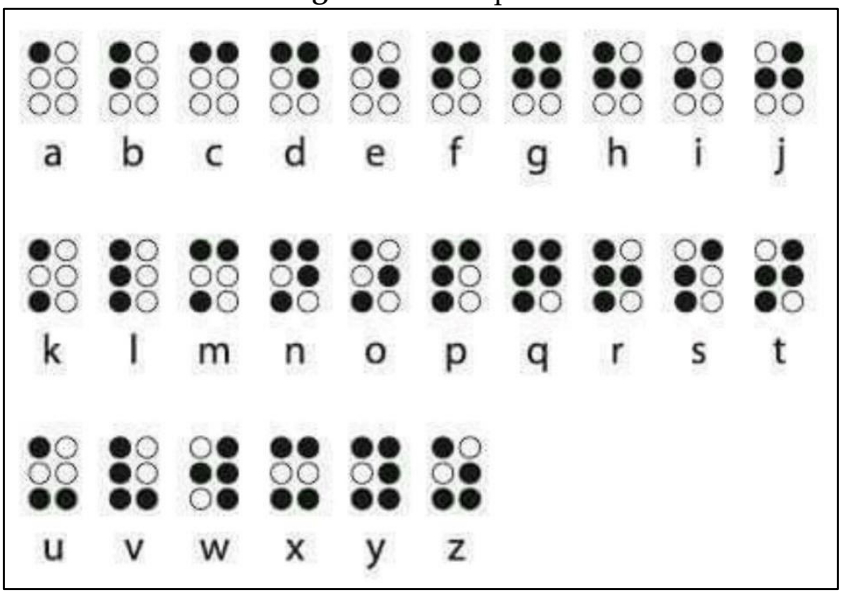
Image description: black and white image. Two braille cells, one above the other. Each with six black balls, arranged in three rows and two columns. In the interval

between the two sets of six balls, there is a top and bottom bracket (vertical) informing the distance between the braille cells is 5 mm.

Image 3 shows the correct distance between the cells from one line to another, that is, when the pad of the index finger finishes reading a line written in braille and performs the "descent" to the line below, this distance is important so that one cell is not too close to another.

Braille writing on the correct materials: the conventional slate and stylus, or the braille typing machine, leave braille exactly with this distance, as they are secular materials and designed for this millimetric interval.

Image 4: Braille alphabet



Source: Made by the author on the computer.

Image description: black and white image. Braille alphabet is written in three lines. The first line has the letter a to the letter j. On the second line: from the letter k to the letter t, and on the third line, from the letter u to z. All letters have a braille cell with six circles. In each letter there is a number of circles painted in black, indicating the points of the respective letter. The letter a contains point 1 painted black. The letter b contains points 1 and 2 painted. The letter c contains points 1 and 4. The letter d, points 1, 4 and 5. The letter e: points 1 and 5. The letter f: points 1, 2 and 4. The letter g: points 1,2 , 4 and 5. The letter h: points 1, 2 and 5. The letter i: points 2 and 4. The letter j: points: 2, 4 and 5. The letter k: points 1 and 3. The letter l , the points: 1, 2 and 3. The letter m: points 1, 3 and 4. The letter n: points 1, 3, 4 and 5. The letter o: points 1, 3 and 5. The letter p: points 1, 2, 3 and 4. Letter q: points 1, 2, 3, 4 and 5. The letter r, points 1, 2, 3 and 5. Letter s: points 2, 3 and 4. Letter t, points : 2, 3, 4 and 5. Letter u, points 1, 3 and 6. Letter v: points, 1, 2, 3 and 6. Letter w: points 2, 4, 5 and 6. Letter y: points 1, 3, 4, 5 and 6, and letter z: points 1, 3, 5 and 6.

Image 4 shows the braille alphabet (with the exception of accented letters, cedilla and tilde). From Image 4, it is possible to see that from the letter "a" to the letter "j" the third line of the braille cell is not used. Only the first and second lines are used. From the letter "k" on, the third line of the braille cell starts to be used.

3. Material and methods

Regarding the materials and research method, we will stick specifically to the slate and stylus. Remembering that, historically, the conventional slate is adequate, tested and approved. In Brazil, in the early 2000s, the positive slate was tested by blind professors at the Benjamin Constant Institute and failed, precisely because of the wrong distance from the braille dots, as well as the poor quality of the braille dots, which made it difficult for the blind to read with the pad of the index finger. In addition, the Brazilian Braille Commission (CBB) also disapproves of the use of the positive slate.

However, even so, later, the positive slate started to be produced and commercialized, in Brazil and in the world. Thus, this text will present the main differences between the two slates (in the physical structure part) and the differences in how the braille writing performed in both slates is. First, an image of the conventional slate and stylus is presented.

Image 5: Conventional slate and conventional stylus (tip)

Source: Photograph taken by the author (personal file)

Image description: color photography. Half-opened metal slate. The slate has 60 braille cells arranged in four lines containing 15 cells in each line. Below the slate, two styluses lie next to each other. The stylus on the left has a round head made of white plastic and the stylus on the right, in black, has a head in the shape of a letter "t". Both styluses have a protruding metal tip. The materials are on top of a light marble surface.

As it can be seen in Image 5, the conventional slate has a hollow cell at the base, that is, when you press the sheet with the stylus, the stylus tip presses the sheet in this hollow of the slate, forming the braille dot. When the sheet is removed from inside the slate and turned over, it can be noticed that the braille was correct and well-marked, allowing the pad of the finger to read.

In this image, there are two different head styluses (one rounded and the other in the shape of the letter "t") to demonstrate that there are styluses with different shapes for the blind to choose the one that best suits their taste in relation to the support of the finger and hand. However, the function is the same and the pointed end is the same on both styluses.

Next, the image of the positive slate and the corresponding stylus is shown.

Image 6: Positive slate and stylus of the positive slate (concave)

Source: Photograph taken by the author (personal file)

Image description: color photography. Blue plastic positive slate ajar. The slate contains 80 braille cells, with 20 cells on each line, in a total of four lines. Below the slate, a dark blue plastic stylus, positioned upright, with the head facing downwards. The punch tip is metal and concave. Both materials are on a light marble surface.

In Image 6, there is the positive slate and the corresponding stylus. From the comparison of Images 5 and 6, it is possible to perceive that the fitting proposals are opposites. While in the conventional slate the ruler is concave and the stylus is pointed, in the positive slate the ruler is protruding and the stylus is concave (with recess). In this way, in the positive slate, when the concave stylus presses the sheet that is supported on the ruler with protruding curves, it performs the pressure and the braille dot is formed.

4. Results and discussion

After presenting how the rulers and styluses of the conventional and positive slates are, respectively, it is necessary to demonstrate how the writing of the letters in braille is carried out in each of the slates.

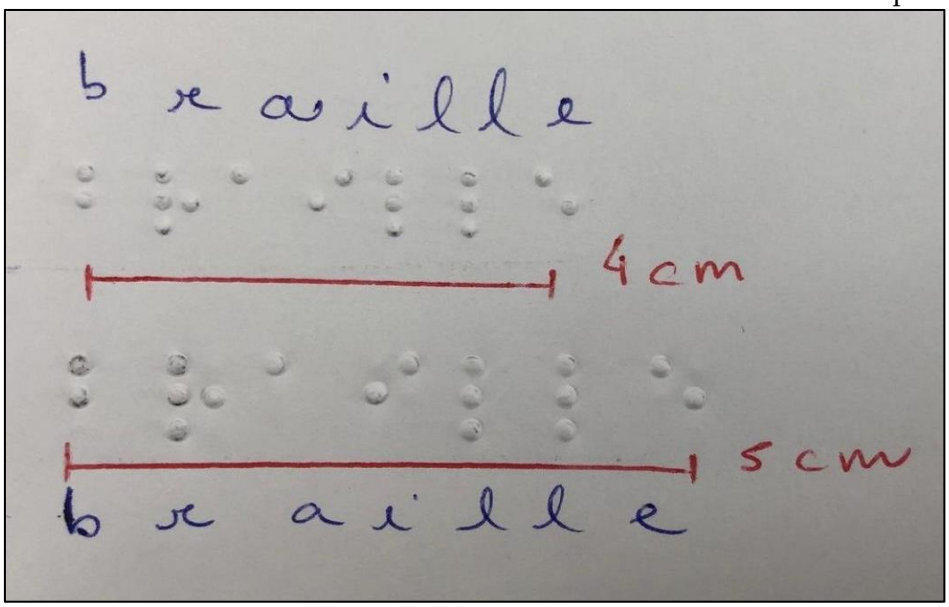
In Image 7 we have the word 'braille' written twice. On the top line, the word 'braille' was written with the conventional slate and, on the bottom line, written with the positive slate. From this image, it is possible to perceive that the distance between the dots is different, as well as the distance between the letters.

When written with the conventional slate, the dots are closer together and the letters are closer together. Furthermore, the circumference of each dot is narrower when written with the conventional stylus.

On the other hand, writing with a positive slate produces a greater distance between dots and letters, as well as a wider circumference of each dot. In this way, it can be seen that in a word (example of the word "braille") there is a difference of 1 cm in total length, which is a huge difference. If we consider that each word will have this difference in length, the amount of distance at the end of the sentence and at the end of the sheet will be even greater.

Another issue that should be highlighted is the issue of tactile perception. When the blind person reads the letter written with the positive slate, they need to move the pad of the index finger even more to feel and contemplate all the dots, while the reading of the letter written with the conventional slate allows a more natural and corresponding perception with the pad of the index finger.

Image 7: Difference between braille written on the conventional slate and the positive slate



Source: Paper written by the author (personal collection)

Image description: color photography. The word 'braille' is written in Braille and ink on two lines. On the top row, the braille letters are closer together compared to the bottom row. Below each word is a red line measuring the length of the word. Next to the measurement line of the word 'braille' on the first line is written: 4 cm. And next to the measurement line of the word 'braille' on the second line is written: 5 cm.

When the positive slate started to be produced and marketed in Brazil, it was informed that there had been a survey carried out by ONCE – National Organization of the Blind in Spain. However, this research was superficial and was not tested with congenitally blind (people who were born blind).

It can be seen that the positive slate is "easier" and more suitable for people who can see, because for those who can see, this increase in the distance between dots and between letters makes no difference. For people who read braille with their eyes, the positive slate is perfect.

However, it is necessary that braille serves correctly and democratically, especially those who need it for a better reading, and this audience is blind people (and not those who can see). Thus, writing on the conventional slate should be encouraged, as it is in this that braille has the correct distance.

5. Recommendations, thanks and conclusion

We recommend that, both in literacy for blind children and for blind adults – who have lost their sight throughout their lives – writing and reading in braille be encouraged. That, preferably, the conventional slate is used and, in some cases, the braille typing machine. As the machine is a heavy and expensive material, the most recommended is the use of a slate, as it is a material that can be easily transported inside a backpack or briefcase.

As for acknowledgements, I would like mainly to thank the blind training teachers who were responsible for my initial learning in braille, and the blind teachers and researchers who daily reinforce the importance of braille writing for the autonomy and independence of the blind person.

Regarding the final considerations of this text, it is worth reinforcing again that the writing of braille on the conventional slate and/or on the braille typing machine must be valued and maintained, as they produce the braille dots with precision and correct distance, allowing the blind person to perform the reading with the pad of the index finger.

It is hoped that this research will contribute to studies on the subject of visual impairment, blindness, studies on braille, on special education and on the inclusion of people with visual impairments in regular schools.

Conflict of Interest Statement

The author declares no conflicts of interest.

About the Author

Raffaela Lupetina is a professor at Benjamin Constant Institute (IBC), an institution specializing in the education of the visually impaired located in Rio de Janeiro, Brazil. At IBC Raffaela teaches in an elementary school class using the Braille reading and writing system. Raffaela completed a Post-Doctorate in Education at the Graduate Program in Education, Contemporary Contexts and Popular Demands at the Federal Rural University of Rio de Janeiro (UFRRJ). She holds a PhD in Education from the State University of Rio de Janeiro (UERJ) for the research line Inclusive Education and Educational Processes. Master in Education from the Federal University of the State of Rio de Janeiro (UNIRIO), Specialist in History from the Fluminense Federal University (UFF), Psychopedagogue from the Candido Mendes University (UCAM) and Licenciate in Pedagogy from the Federal University of Rio de Janeiro (UFRJ). Raffaela coordinates the research group GPESBRA: Research Group on the Braille System. She is the deputy coordinator of GPEAD: Research Group on Audiodescription, and a member of the Research Group on School Life and Special Education: Body, Curriculum and Inclusion (GPCECI), these from the IBC. She is trained as a Guide-Interpreter to work with people with deafblindness, certified by the Brazilian Group for Support to the Deafblind and the Multiple Sensory Disabled. She is a member of the Brazilian Association of Researchers in Special Education in Brazil (ABPEE). She is the author of the books: “Life stories of individuals with acquired deafblindness” (Ed. Appris) and “Female Voices: narratives of blind teachers” (Casa Editorial). She develops research on the following topics: special education, visual impairment, reading and writing in Braille, deafblindness, forms of tactile communication, audio description and teacher training.

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Lupetina, Raffaela de Menezes. Challenges of literacy and writing in braille with visually impaired students. In.: SOUSA, Ivan Vale de. Inclusive Education in Brazil: visual impairment and technologies (Collection Inclusive Education in Brazil, Volume 3) Jundiaí: Paco Editorial, 2019.